

Analysis of climate and topographic effect on wildfire regime in Liguria, Italy

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Wildfire risk is particularly significant in Italy, both in summer and winter season due to the high topographic and vegetation heterogeneity of the territory. Liguria is one of the few regions in Italy affected by wildfires both in summer and winter. Most of the fires in Italy occur in summer season and the burned area is largely greater than in winter season. In Liguria, the number of wildfires and the burned area is higher in winter than in summer. Winter fire regime is mainly due to frequent extremely dry winds from the north in condition of curing for most of the herbaceous species. Southern and central regions and the large islands are characterized by a severe summer fire regime, because of the higher temperatures and prolonged lack of precipitation. The threat of wildfires in Italy is not confined to wooded areas as they extend to agricultural areas and urban-forest interface areas.

In view of the limited availability of fire risk management resources, most of which are used in the management of national and regional air services, it is necessary to precisely identify the areas most vulnerable to fire risk. The few resources available can thus be used on a yearly basis to mitigate problems in the areas at highest risk by defining a program of forest management interventions.

The availability of a mapping of fire perimeters spans almost 20 years (1996-2013), and this, combined with a detailed knowledge of topography, climate and land cover allowed to understand which are the main features involved in forest fire occurrences and their behavior. The seasonality of the fire regime was also considered, partitioning the analysis in two macro season (November-April and May- October). Total precipitation and average air temperature obtained from the interpolation of 30 years-long time series from 164 raingauges and 127 thermometers series were considered.

The analysis was based on a recursive-quantiles subdivision of the territory in classes based on the different available information layers: elevation, slope, aspect, rainfall height, temperature (the latter subdivided in winter and summer periods). The algorithm is designed in order to assure the equal representation of each class, in which the number of fires occurred in the period of analysis is considered, in order to have an estimation of the fire hazard with a constant statistical confidence.

The analysis was carried out at a spatial resolution of 20 m on the Liguria region territory (5400 km²) by using a dataset of fires occurrences that spans from 1996 to 2013. The results show a very high correlation with the topographic aspects both in winter and summer. Rainfall is almost uncorrelated in both season. Air temperature is high correlated with the burned area but it is strictly related with elevation. Independently by the season and the vegetation cover, elevation and slope show a very high correlation with the burned area determining almost completely the wildfire regime in Liguria.